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Session Ab - Turbulence Theory.

*ORAL session, Sunday, November 23
302, Moscone Center*

[Ab.07] Sufficient Condition for Finite-Time Singularity in a High-Symmetry Euler Flow

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The possibility of a finite-time singularity (FTS) with a smooth initial condition is considered in a high-symmetry Euler flow (the Kida flow). It has been shown recently [C. S. Ng and A. Bhattacharjee, Phys. Rev. E 54 1530, 1996] that there must be a FTS if the fourth order pressure derivative (p_{xxxx}) is always positive within a finite range X on the x -axis around the origin. This sufficient condition is now extended to the case when the range X is itself time-dependent. It is shown that a FTS must still exist even when $X \rightarrow 0$ if the p_{xxxx} value at the origin is growing faster than X^{-2} . It is tested statistically that p_{xxxx} at the origin is most probably positive for a Kida flow with random Fourier amplitudes and that it is generally growing as energy cascades to Fourier modes with higher wavenumbers k . The condition that p_{xxxx} grows faster than X^{-2} is found to be satisfied when the spectral index ν of the energy spectrum $E(k) \propto k^{-\nu}$ of the random flow is less than 3.

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